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Development of a Grazing-incidence Insertion Device X-ray Beam Position Monitor

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Beam stability is always a concern in synchrotron light source facilities, and accurate and stable x-ray beam position monitors (XBPM) are key elements in obtaining desired user beam stability. Currently, APS is preparing to upgrade its facility to increase productivity and to provide better beam stability. To achieve beam stability of 3.0 μm horizontally and 0.3 μm vertically within a frequency band up to 200 Hz, a grazing-incidence insertion device x-ray beam position monitor (GRID-XBPM) is proposed for the insertion device beamline front ends instead of the current photoemission-based XBPM. In principle, if we measure the distribution of the x-ray beam footprint on a front-end component, its x-ray fluorescence footprint can be imaged to infer the position of the photons. Users often discard more than 50% of the insertion device beam power outside of the monochromatic beam. Thus, our conceptual design of the GRID-XBPM is to slice the collimator into right and left halves and to displace them along the beam direction with a grazing-incidence angle to increase the beam footprint and to provide room for the beam footprint measurement. The development of a GRID-XBPM will be summarized, which includes the thermal simulation results and the design of the relevant upstream and downstream components of the GRID-XBPM such as a fixed mask and a photon shutter.